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METEOROLOGICAL PREDICTIONS.

TIME is the touch-stone of prophecy, and in many respects the only reliable test of all theories whatever. In the Court of Science no hypothesis, however plausible, can be definitely accepted till the unanimous verdict of experience has confirmed its claim, and the discovery of any new evidence, clearly at variance with those claims, at once opens the case for a new trial. A few years ago a champion of alcoholic beverages tried to establish his tenets by calling attention to the analogies of the human and simian organism, and the alleged fact that monkeys are naturally fond of ardent drinks, so much, indeed, that the Abyssinian mountaineers need only expose a pailful of plum brandy to attract and befuddle all the baboons they want to catch. The argument seemed, indeed, a valid basis for all sorts of inferences, till Brehm ascertained the circumstance that the seductive fluid requires so large an admixture of saccharine elements as to completely disguise its taste, and that a baboon, caged up within reach of raw brandy, will crouch down and suffer like an Iowa juryman, rather than quench its thirst with the obnoxious liquor. And even with demonstrably correct premises, the logic of the inference may be vitiated by the omission of recondite factors, as in the argument of Ehrenberg's "Parable for Dogmatists":—"Suppose that a limited acquaintance with mountain heights had given us reason to infer that highlands were warmer than valleys, would not a majority of natural philosophers promptly explain the assumed fact on a well-established rule of thermal phenomena? 'Warm air ascends,' they would argue, 'as you may see by lighting a fire under an open balloon, or by watching the sparks of the chimney flue. Cold air descends, as you may ascertain by lowering a thermometer into a well or cave. Therefore, valleys *must* be cooler than mountain peaks. Besides, the latter are so much nearer the sun, and catch its first and last rays.' Nine out of ten students, not to mention the legion of repeaters (*Nach-beter*), would reverently admit the cogency of the argument till some irreverent investigator should happen to prove the existence of snow on the top of all very high mountains."

The suggestions of that parable are often recalled by the dogmatism of our meteorological and geological theorists. An influential faction of the inquirers—or inquisitors—of the latter class, for instance, have agreed to combine against every opponent of the "subsidence theory of seismic phenomena," the hypothesis, namely, that the more violent earthquakes are caused by the gradual contraction of the earth's crust and the consequent occasional collapse of subterranean rock-vaults,—in opposition to the view that the infiltration of water upon the furnaces of the interior earth and the dynamic omnipotence of expanding steam are amply sufficient to account for the upheaval of the superincumbent strata. An exponent of the latter theory suggests that all the conditions favoring the possibility of that infiltration would be combined at the bottom of deep marine basins, where the crust dividing the torrid *inferno* from the elements of the upper world is often from ten thousand to twenty-five thousand feet thinner than in the deepest valleys of terra firma, besides being subjected to the dissolving influence and the tremendous pressure of the superimposed water-masses. The subsidence theory still prevails ; but it so happens that the volcanoes of the earth are all ranged along the shores of the deepest seas, and that earthquakes show a similar bias of topographical predilection. A coast-belt of fifty miles along the shores of the ocean and deep inland seas would comprise the scenes of all violent earthquakes : Lisbon, Messina, Lima, Caracas, Antioch, Batavia, Charleston, and San Salvador, the rare exception being limited to the lower valleys of deep rivers with a swamp delta of insignificant elevation above the level of its estuary. Hot springs and jets of vapor, bursting from the rocks of a coast-range, have often heralded the approach of an earthquake, and the emanation of pent-up steam, in a more diffused form, through countless fissures and caves, might account for that curious haze which has so often been observed on the eve of a seismic upheaval. On the day before the Charleston earthquake it clouded the Eastern Alleghanies from Georgia to Maryland ; on the day before the last Mediterranean earthquake it clouded the Western Apennines and the Lepontine Alps. "Many of the strongest shocks on this coast," says Professor Hittell (*Resources of California,* p. 44), "have been preceded by a condition of the atmosphere very similar to that which precedes thunder-storms in other lands. When the weather is sultry and oppressive in San Francisco, people say, 'Look out for an earthquake!' and it usually comes." "*La Niebla,*" the Spanish-Americans call that condition of the atmosphere, and never question the theory connecting its origin with the influence of a subterranean hypocaust. On that theory earthquakes *might* be predicted. That they can *not* be predicted on any correlatives of the subsidence hypothesis, or of Kluge's "sidereal theory," is frankly admitted by Professor Montessus, of the meteorological observatory at San Salvador, Central America (*Revue Scientifique,* March, 1886). "But," he adds, "while I do not think it is possible in the present state of knowledge to predict earthquakes, I believe that their phenomena are connected with atmospheric conditions, which, subjected to a systematic study, might lead to the discovery of some law. This is so true that persons who have lived long in the country often say when they meet, withont knowing why, 'there will be an earthquake to-day,' and they are seldom mistaken."

During the night before the catastrophe that convulsed the rocks of the Riviera, the waters of the Mediterranean suddenly receded *twenty-two inches* below their normal level, and the Genoese fishermen at once stood out for the open sea, rightly concluding that "there must be some trouble brewing." If that trouble had been caused by the subsidence of subterranean strata, a violent shock would immediately have followed that collapse, but if the recession of the sea was induced by an ingulfment of its deeper waters through a fissure in the bottom of the basin, the inchoate struggle between heat and moisture, and the momentary depressing thermal effect of the invading flood, could sufficiently account for a short delay in the crisis of the catastrophe. The utter fatuity of the "sidereal conjunction hypothesis" has been so clearly proved in the course of the last four years that neither Professor Kluge nor Mr. Wiggins are apt to found their future predictions on the claim of astronomical observations.

The rain and storm bulletins of our meteorological observatories are founded on less spurious data, but only a small minority of their readers may realize how rarely the correctness of their prognosis can be guaranteed for a limited space of time or territory. Weather predictions, in their present form, are, in fact, mostly nothing but generalizations of an *ex post facto* inference. A humid coast-wind, or a polar wave, reach a given point, at a time, with a speed, and in a direction offering data for the conclusion that in a certain number or hours the same phenomena will be experienced at certain other points, and thus furnish a basis for more extensive prognostications, or that a cyclone, turning in the curve of an ascertained ellipse, will gradually work back towards its focus of origin,—always barring the possibility of unforeseen and unforeseeable counteracting influences. There are local as well as territorial causes of weather phenomena. A tendency to a change from dry to humid weather may spread from the valley of the Mississippi to Alabama, and justify the hope that in the course of a certain day a protracted drought will be likewise broken in the State of Georgia. On the morning of that day, the expected clouds, perhaps, actually appear on the horizon of Atlanta, and gradually overspread the whole firmament; but the expected rain may, after all, be vouchsafed only to regions where rainshowers have been of frequent occurrence all through the summer, such as the bottom lands of a large stream or the valleys of a humid mountain forest, while the arid plateaux, where rain is most sorely needed, may be disappointed in their hope of a single drop. Nay, in the treeless plains the drought may become more grievous, from the tendency of a cloudy sky to diminish the blessing of heavy night dews. Tornadoes, after following their curve for hours, may suddenly veer off at a tangent to their former course; in March, a sudden north wind may precipitate, in the form of snow, the atmospheric moisture of extensive woodlands, and thus rivet the fetters of winter for weeks to come, while a little further southwest the same wind may break the veil of light nimbus clouds and inaugurate a period of genial sunshine.

For the purposes of local vaticination, the science of meteorology, has, in fact, not yet reached the degree of exactness that would justify farmers and hunters in discarding the aid of our traditional weather rules, or diminish the value of an as yet unwritten work, combining those rules in anything like a coherent system. Nay, for domestic purposes the formulation even of unconnected, and apparently unexplained, weather maxims would often enable their adept to modify a programme based upon the augurations of the city newspaper. No theorem of our Government aruspices has, for instance, as yet explained the curious fact that in nine out of ten cases a Texas "norther" prevails for exactly three days, and that in the Middle States three days of winter frosts, or winter sunshine, are as invariably followed by a protracted rain. Dove's rule explains, or at least records, the fact that in the Northern Hemisphere the wind generally veers from left to right, thus (with occasional fluctuations) completing its circle from East to South, West and North, rather than in the opposite direction. But how does that rule, or any other known law of atmospherical tendencies, account for the circumstance that a polar wave following a period of rains and *south winds* is always more violent and chilly than a wave from the same direction following a period of rains and protracted *west winds;* in other words, that after a turn through the semi-circle of the compass, the fury of a blizzard is more outrageous than after a turn through a quarter segment? The evidence of the thermometer proves that the difference is not due to an apparent effect of contrast, and there is no imaginable clew to the causal connection of the consecutive phenomena, yet the fact can be verified a dozen times in the course of any North American winter. A chilly rain may set in with a west wind (as in Kentucky with the moist northwest gales from the Mississippi Valley), and continue for days, and the subsequent north wind will bring nothing but a welcome change to clearer, though slightly cooler, weather. But aftar a south-wind rain, often attended with positively sultry weather, and even with thunder showers, the ensuing north wind is sure to stampede the cattle in every direction and make the elated mercury shrink with the suddenness of a bribed quorum.

Again, who has not often noticed the fact that, on a murky winter's day, swift-driving white clouds bring rain, but lowering, dun clouds snow? "Look at those slate-colored streaks, we'll have another big snow before long;" "There's that smoky sky again, we'll get another week's sleighing before the end of this winter," are familiar phrases all over the North States of our Union.

> "Evening red and morning gray,
> Helps the traveler on his way,"

says an old adage, and I have often suspected that the second half of the first line has been added merely for the sake of the rhyme. A bright day begins with a bright, as often as with a cloudy, morning, but a ruddy sunset is an almost infallible fair weather omen, though it is a singular fact that rain does not follow upon a cloudy evening half as certainly as upon a pale bright, or yellowish bright, evening. A reddish, transparent evening sky, or often yet a sunset sky streaked with crimson, thin-drawn clouds, means fair weather in nineteen out of twenty cases, and the rule holds good in the sierras of southern Mexico, as well as on the plains of the upper Missouri and the highlands of the southern Alleghanies. *Latet causa, res tamen notissima,* and the scientific progress of the next seven centuries may fail to furnish a plausible explanation, but that does not impair the practical utility of the rule.

Storms, too, are heralded by all sorts of portents not mentioned in the index of General Myer's manual, such as the soughing, intermittent gusts of a warm night wind, sudden dust whirls breaking the lethargy of a sultry afternoon, and a peculiar, diffused appearance of the above-mentioned saffron colored sunset, which often causes the schooners of the Caribbean Sea to reef their sails in wild haste, before there is a single cloud in sight. Not every calm portends a storm, but in cloudy weather sailors dread that heavy and breathless torpor of the atmosphere that gives the surface of the sea a *leaden* appearance, and the herders of the Mexican sierras hurriedly drive their flocks to shelter if they find that the approach of night fails to lower the temperature of the highlands, or that a blast of wind sways the treetops of a special hillside, while not a break stirs the forests of the surrounding mountains. The latter phenomenon may be analogous to the approach of what sailors call a "white squall" ploughing its way through a circumscribed tract of the sea, but squalls are often the concomitants of thunder showers, which, in the Cordilleras, are as rare as in upper California.

The general rule, that evaporation causes a decrease of temperature, is curiously modified by the thermal influence of large freshets following a heavy fall of winter rains. In the Ohio Valley, for instance, the devastating floods of the last ten years nearly invariably inaugurated a period of mild, moist weather, often strangely confined to the neighborhood of the submerged districts. Wave after wave of cold currents might sweep down from the north, and prevail for an hour or two, but the contact with the atmosphere of the inundated lowlands at once seemed to temper their force and mock the persistent display of a "blizzard signal." Floods are but rarely checked by protracted frosts, and if sea water has an analogous influence, the irruption of the Zuyder Sea might really account for that series of mild winters which the chronicles of North Holland associate with the submergence of the coast districts, though Camper ascribes both the effect and its alleged cause to the disappearance of the woodlands, sacrificed to the naval enterprises of the same century.

But there is no doubt that forest destruction, on a large scale, tends to aggravate the severity of summer droughts and winter floods, and if unvaried analogies of cause and effect can furnish data for a long-range prognosis of meteorological events, we might venture the prediction that before the end of the next century the uplands of all our Southern and Western cotton States will become dependent on irrigation, and that in the Ohio Valley the alternative of protective forest laws will be the construction of protective dikes from Pittsburgh to Cairo. On the Atlantic coast, too, many navigable rivers will become fordable brooks in September and raging seas in March; the summers of our entire Atlantic slope will become dryer, and the winters rainier and milder.

For the purpose of such forecasts the study of international weather charts might lead to less popular predictions than the calculation of local horoscopes for the next twenty-four hours; yet an impartial comparison of the results would, on the whole, justify the conclusion that meteorology, as a science, can discern the portents of the sky from a distance too misty for the optical resources of the unaided eye, which, nevertheless, may read the presage of the day by omens not dreamed of in the dogmas of telescopic philosophy.

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